

Serial No.: 09/707,852
Conf. No.: 9828

- 3 -

Art Unit: 1744

In the Claims

Please replace all prior versions, and listings, of claims in the application with the following list of claims:

Please amend claims 156 and 157 as noted below.

Please add new claims 174 and 175 as noted below.

1-155. (Cancelled).

156. (Currently Amended) A system for maintaining and cultivating cells in culture and obtaining a ~~product~~ protein resulting from interaction of the cells with oxygen and/or nutrients and/or other components, comprising:

a small-scale chemical or biochemical reactor comprising a plastic substrate comprising a plurality of reaction units constructed to operate in parallel, each reaction unit comprising a chamber having a surface suitable for cell growth and a volume of less than about 1 ml, the chamber being constructed and arranged to maintain and cultivate cells in culture for at least a period of time sufficient to generate a ~~product~~ protein resulting from interaction of the cells with oxygen and/or nutrients and/or other components, the chamber further comprising an inlet fluidly connectable to a source of nutrients for the cells having a controlled pH, an outlet for release of a ~~product of a chemical or the protein resulting from the interaction biological reaction~~ involving the cells in the chamber, and ~~a membrane~~ an oxygen permeable thin layer interface defining at least one wall of the chamber, ~~the membrane being able to transport oxygen therethrough~~ whereby distribution of the oxygen to the cells takes place through the thin layer interface, and wherein the thin layer interface provides the ability for cell nutrient transfer to take place; and

~~a gas enclosure positioned proximate the chamber, comprising a fluid inlet and an outlet for facilitating oxygen transfer across the membrane between the chamber and the gas enclosure.~~

157. (Currently Amended) A system as in claim 156, further comprising means for controlling the temperature of the chamber to maintain a temperature suitable for

Serial No.: 09/707,852
Conf. No.: 9828

- 4 -

Art Unit: 1744

cultivating cells to generate the ~~product~~ protein resulting from interaction of the cells with oxygen and/or nutrients and/or other components.

158. (Previously Pending) A system as in claim 156, the chamber having a volume of less than about 100 microliters.
159. (Previously Pending) A system as in claim 158, the chamber having a volume of less than about 10 microliters.
160. (Previously Pending) A system as in claim 159, the chamber having a volume of less than about 1 microliter.
161. (Previously Pending) A system as in claim 156, further comprising a mixing unit fluidly connectable to the inlet of the chamber, the mixing unit including an outlet connectable to the inlet of the reaction chamber, a plurality of inlets each in fluid communication with the outlet and a mixing chamber between plurality of inlets and of the outlet.
162. (Previously Pending) A system as in claim 161, wherein the mixing unit chamber is free of active mixing elements.
163. (Previously Pending) A system as in claim 156, further comprising a heating unit having an inlet, and an outlet connectable to the inlet of the chamber, the heating unit separable from and attachable to the chamber.
164. (Previously Pending) A system as in claim 156, the reactor further comprising sensors each of temperature, pH, and oxygen concentration.
165. (Previously Pending) A system as in claim 156, the reactor further comprising a temperature sensor.

Serial No.: 09/707,852
Conf. No.: 9828

- 5 -

Art Unit: 1744

166. (Previously Pending) A system as in claim 156, the reactor further comprising a pH sensor.
167. (Previously Pending) A system as in claim 156, the reactor further comprising an oxygen sensor.
168. (Previously Pending) A system as in claim 156, wherein the plurality of reaction units are attachable to and separable from each other, constructed and arranged to operate in parallel.
169. (Previously Pending) A reactor as in claim 156, comprising at least 10 reaction units constructed to operate in parallel.
170. (Previously Pending) A reactor as in claim 169, comprising at least 100 reaction chambers constructed to operate in parallel.
171. (Previously Pending) A reactor as in claim 170, comprising at least 500 reaction chambers constructed to operate in parallel.
172. (Previously Pending) A reactor as in claim 171, comprising at least 1,000 reaction chambers constructed to operate in parallel.
173. (Previously Pending) A reactor as in claim 172, comprising at least 10,000 reaction chambers constructed to operate in parallel.
174. (New) A system for maintaining and cultivating cells in culture and obtaining a protein resulting from interaction of the cells with oxygen and/or nutrients and/or other components, comprising:
a small-scale chemical or biochemical reactor comprising a plastic substrate comprising a plurality of reaction units constructed to operate in parallel, each reaction unit comprising an inlet, an outlet, and a fluid pathway connecting the inlet and the outlet,

Serial No.: 09/707,852
Conf. No.: 9828

- 6 -

Art Unit: 1744

the fluid pathway comprising a chamber having a surface suitable for cell growth and a volume of less than about 1 ml, the chamber being constructed and arranged to maintain and cultivate cells in culture for at least a period of time sufficient to generate a protein resulting from interaction of the cells with oxygen and/or nutrients and/or other components, the chamber further comprising an inlet fluidly connectable to a source of nutrients for the cells having a controlled pH, and an outlet for release of the protein resulting from the interaction involving the cells in the chamber;

a membrane defining at least one wall of the fluid pathway; and

an enclosure positioned proximate the membrane, wherein at least one product of the interaction involving cells in the chamber passes across the membrane into the enclosure.

175. (New) A method of maintaining and cultivating cells in culture and obtaining a protein resulting from interaction of the cells with oxygen and/or nutrients and/or other components, comprising:

providing a small-scale chemical or biochemical reactor comprising a plastic substrate comprising a plurality of reaction units, each reaction unit comprising an inlet, an outlet, and a fluid pathway connecting the inlet and the outlet, the fluid pathway comprising a chamber having a surface suitable for cell growth and a volume of less than about 1 ml, and a thin layer interface defining at least one wall of the chamber;

operating the plurality of reaction units in parallel by, for each reaction unit:

introducing, into the chamber, via the inlet, nutrients for the cells having a controlled pH;

introducing, into the chamber through the thin layer interface, oxygen for distribution to the cells;

cultivating the cells in culture for at least a period of time sufficient to generate a protein resulting from interaction of the cells with oxygen and/or nutrients and/or other components; and

releasing, through the outlet, the protein resulting from the interaction involving the cells in the chamber.